4. The general trend has been south, south-east, and south-west, but frequently deflected east and west by ranges and pre-existing valleys. The great Flathead glacier west of 114° shows a length of 150 miles from boundary. Along a line 150 miles south of boundary, which rapidly swings to the north as we go westward, the lower limits (moraines) of this series of glaciers is evident. To the south of these the glaciers have had a northerly trend, forming a series of valleys running north and south. Short glaciers, radiating from local heights, as at Libby, and Missoula and various other places, were common. Some of these have no doubt been persistent for some time since the glacial period proper.

5. With the recession of the glaciers the lakes were drained to the west.

6. Existing glacial lakes are four or five in number. They are rock-basins eroded no doubt greatly before the glacial period. In nearly all cases they are dammed by terminal moraines.

7. The area touched upon is 300 miles (E. and W.) by 100–150 miles (N. and S.). The fall being to the west and south as noted; on the map it may be found from the 49th parallel on the north to the 47th on the south, from the Rockies (main range on east) to Idaho boundary-line.

8. Terraced valleys of much interest occur, but to which no detailed study has been given.

THE SHRINKAGE OF LEAVES.

BY E. E. BOGUE.

PROBABLY every maker of botanical specimens has observed that the leaves when dry are smaller than when fresh. The wish to know how much the shrinkage might be led to the following measurements. The leaves were measured before they had wilted, and after they were perfectly dry.

The longest dimensions were taken in each case. The width or dimension across the midrib is first given in each case; the first column shows the measurements when fresh, and the second column the measurements when dry. All measurements are given in inches and parts of an inch.

Scarlet Oak (Quercus coccinea).

Fresh.	Dry.
$7\frac{3}{8} \times 12\frac{1}{2}$	$7\frac{3}{16} \times 12\frac{5}{16}$
$6\frac{1}{8} \times 11\frac{1}{2}$	$6 \times 11\frac{3}{8}$
$6\frac{5}{8} \times 12\frac{1}{2}$	$6\frac{9}{16} \times 12\frac{7}{16}$
$6\frac{1}{4} \times 12$	$6\frac{1}{8} \times 11\frac{13}{16}$

Arisæma triphyllum (Indian Turnip).

$4\frac{13}{16} \times 9$	$4\frac{3}{4} \times 9$
$5\frac{1}{4} \times 8\frac{3}{4}$	$5\frac{1}{4} \times 8\frac{5}{16}$
$4\frac{1}{2} \times 7\frac{3}{4}$	$4\frac{1}{3} \times 7\frac{1}{3}$
$4\frac{3}{4} \times 7\frac{3}{16}$	$4\frac{11}{16} \times 7\frac{1}{6}$
$5\frac{3}{16} \times 7\frac{1}{2}$	$5\frac{1}{8} \times 7\frac{1}{2}$

Asimina triloba (Common Papaw).

$4\frac{7}{8} \times 12\frac{5}{8}$	$4\frac{3}{8} \times 12\frac{5}{8}$
$4\frac{7}{8} \times 13$	$4\frac{1}{4} \times 12\frac{7}{8}$
$3\frac{7}{8} \times 10\frac{7}{8}$	$3\frac{13}{16} \times 10\frac{9}{16}$
$4\frac{1}{16} \times 12$	$4 \times 11\frac{7}{8}$
$5 \times 13\frac{7}{8}$	$4\frac{7}{8} \times 13\frac{3}{4}$

Arctium Lappa (Burdock)

$9\frac{5}{8} \times 15\frac{3}{4}$	$9\frac{1}{2} \times 15\frac{3}{4}$
$11\frac{5}{16} \times 17\frac{7}{16}$	$11 \times 17\frac{1}{4}$
$9\frac{1}{2} \times 14\frac{3}{4}$	$8\frac{7}{8} \times 14\frac{7}{16}$

Asclepias cornuti (Milkweed).

$4\frac{1}{2} \times 7\frac{15}{16}$	$4\frac{1}{16} \times 7\frac{13}{16}$
$4\frac{1}{2} \times 9\frac{1}{4}$	$4\frac{1}{16} \times 9$
$4\frac{1}{2} \times 9\frac{3}{16}$	$4\frac{3}{8} \times 9$
$4\frac{1}{8} \times 9\frac{1}{16}$	$3\frac{15}{16} \times 8\frac{7}{8}$
$3\frac{13}{16} \times 8$	$3\frac{11}{16} \times 7\frac{3}{4}$

Acer saccharinum var. nigrum (Sugar Maple).

$5\frac{7}{8} \times 5\frac{1}{16}$	$5\frac{3}{4} \times 5$
$6\frac{11}{16} \times 5\frac{7}{8}$	$6\frac{5}{8} \times 5\frac{13}{16}$
$7\frac{7}{8} \times 5\frac{7}{16}$	$7\frac{3}{4} \times 5\frac{3}{8}$
$7\frac{5}{8} \times 5\frac{7}{8}$	$7\frac{1}{4} \times 5\frac{13}{16}$
$6\frac{7}{16} \times 5\frac{1}{4}$	$6\frac{3}{8} \times 5\frac{1}{4}$

Abutilon avicennæ (Velvet-Leaf).

$8\frac{5}{16} \times 8\frac{5}{16}$	$8\frac{1}{4} \times 8\frac{1}{4}$
$9 \times 9\frac{5}{8}$	$8\frac{7}{8} \times 9\frac{1}{2}$
8×8	$7\frac{7}{8} \times 7\frac{13}{16}$
$3 \times 3\frac{1}{8}$	$2\frac{1}{16} \times 3$
$9\frac{3}{16} \times 8\frac{7}{8}$	$9 \times 8\frac{3}{4}$
$9 \times 9\frac{1}{4}$	$8\frac{3}{4} \times 9$
$8\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{7}{16} \times 8\frac{1}{2}$

Rumex obtusifolius (Bitter Dock).

$5 \times 11\frac{1}{4}$	$4\frac{7}{8} \times 11$
$4\frac{11}{16} \times 8\frac{1}{2}$	$4\frac{7}{16} \times 8\frac{1}{8}$

Platanus occidentalis (Sycamore).

$8\frac{1}{4} \times 6\frac{1}{2}$	$8\frac{1}{16} \times 6\frac{3}{8}$
$8\frac{7}{8} \times 7\frac{1}{8}$	$8\frac{3}{4} \times 6\frac{7}{8}$
$9\frac{1}{4} \times 6\frac{1}{2}$	$8\frac{3}{4} \times 6\frac{1}{2}$
$7\frac{5}{8} \times 6\frac{1}{16}$	$7\frac{1}{4} \times 6$

Nymphæa odorata (Sweet-scented Water-Lily).

7×7	$6\frac{1}{4} \times 6\frac{1}{4}$
$10 \times 8\frac{3}{4}$	$9 \times 8\frac{1}{4}$
$8\frac{1}{2} \times 7\frac{3}{4}$	$7\frac{1}{2} \times 7$
14×14	13×13
$11\frac{1}{4} \times 10\frac{1}{2}$	$10\frac{3}{8} \times 9\frac{11}{16}$

Nelumbo lutea (Yellow Nelumbo).

$11\frac{15}{16} \times 12\frac{1}{2}$	$11\frac{3}{8} \times 11\frac{15}{16}$
$13\frac{1}{2} \times 14\frac{3}{8}$	$13\frac{1}{4} \times 13\frac{7}{8}$
$12 \times 12\frac{1}{4}$	$11\frac{5}{8} \times 11\frac{3}{4}$
$12\frac{3}{4} \times 13\frac{5}{16}$	$12\frac{1}{2} \times 12\frac{3}{4}$
$12\frac{1}{4} \times 12\frac{1}{4}$	$11\frac{13}{16} \times 11\frac{7}{8}$
$9\frac{1}{16} \times 9\frac{1}{2}$	$9 \times 9\frac{1}{16}$

The leaves were pressed enough to keep them from wrinkling. A piece the size of a mounting-sheet ($11\frac{1}{2} \times 16\frac{1}{2}$) was cut from a leaf of the Nelumbo, and was found to decrease from that size to $11 \times 15\frac{1}{16}$. It will be seen that the least shrinkage was in the Indian turnip (the measurements here referring to leaflets), and the greatest shrinkage in the water-lily. Petioles of the sugar-maple were measured and ranged from $2\frac{3}{4}$ to $4\frac{7}{16}$ in length, but were shortened by drying, if at all, less than $\frac{1}{16}$.

It will be noticed that in the velvet leaf the small immature one decreased more even than the largest one.

Ohio State University, Sept. 10.

LETTERS TO THE EDITOR.

Pre-Aino Race in Japan.

I MUCH regret that Prosessor Morse should think that I have intentionally misrepresented or carelessly disregarded his views concerning the pre-Aino occupancy of Japan, as he rather vigorously maintains in *Science* of Sept. 9. It can scarcely be said that I have claimed for myself the discovery that there was a race of people in Japan before the Ainos. The most I have endeavored to show is the possibility,—I do not even go so far as to suggest the probability,—that the pre-Aino inhabitants of Japan may have been the people who dug the pits in Yezo.

As regards the Aino occupancy of Japan, Professor Morse will find that the "historical records" of the country, which he mentions, have not been disregarded in my article, and, in fact, the evidences of the shell heaps are, to my mind, the least convincing of any, until the fact of the Aino origin of them is established. It is the historical evidence, the distribution of geographical place-names, and, last but not least, Japanese tradition, which are at present the strongest evidences in this connection.

An author may be criticised for sins of omission, and even for

errors due to misapprehension; but to charge him with neglect and wilful misrepresentation of another's views involves a presumption of motives which, I trust, are not common among students of science. I have the highest regard for Professor Morse personally and for his valuable and painstaking work in Japan, not only upon this subject but upon others, and I certainly would not willingly misrepresent his views nor disregard them. He will no doubt have observed that this part of the subject is treated in a much briefer manner than might have seemed desirable, otherwise I do not think he would have found any cause for complaint.

ROMYN HITCHCOCK.

The Woodmont, Washington, D.C., Sept. 12.

On Biological Nomenclature.

PROFESSOR UNDERWOOD'S article in *Science* for Aug. 26 calls for a general expression of views on this subject. The article above referred to was written from the standpoint of the botanist, while the present one will be perhaps more from a zoölogical standpoint. The writer, however, recognizes no distinction between the two, and firmly believes that the system of nomenclature should be absolute and uniform for all branches of biology. Absolutely the same rules should be recognized throughout the departments of botany and zoölogy, and these rules and regulations ought to be speedily decided upon by a congress of the leading biologists of the world, to which every country and organization so interested should send delegates. In the meantime every one follows his own particular ideas in regard to the matter, which may be either right or wrong.

I desire here to express my unprejudiced but very decided views on the seven questions which Professor Underwood puts, and will preface them with the remark that in no case can the name of the original erector and describer of a genus or species be separated therefrom without gross injustice.

1. Shall there be an initial date in nomenclature? Let us by all means recognize the validity of the first names proposed when accompanied by a sufficiently recognizable description and not preoccupied. In some cases, as with many of the older authors, descriptions must be recognized which would not be considered sufficient at the present day.

2. Shall names long used be laid aside when claimed for other plants [or animals] on grounds of strict priority? They should, when it is unmistakably evident that the original describer so intended.

3. Shall "the first name under a genus" hold against a previous specific name? By no means. The specific name first proposed should, coupled with the name of its original describer, follow the name of whatever genus it may be finally relegated to.

4. Shall varietal names have priority over established specific names? Yes, but with the name of the original proposer attached. I do not agree with Professor Underwood on this point, but believe that varietal names lay claim to the same priority as specific names, *when they are found to be valid.*

5. Can inappropriate names be cancelled on that ground alone? They cannot with any degree of justice.

6. How far has a later writer a right to correct names previously established? He has no right whatever to in any way change the spelling of a name from what was intended by the original describer. If by a typographical error the name was printed wrong, and the author corrects it later in print, his correction should be accepted. I am strongly in favor, however, of beginning *all* specific names with small letters, whatever their origin, and making all compound specific names into simple terms by writing them with the hyphen dropped. I would write *Brevoortia idamaia* Wood, or *donnellsmithii*, or *mariaewilsoni*, to use Professor Underwood's examples. I have no right to change the endings in any way whatsoever, neither have I the least right to supply a syllable apparently omitted, judging from the derivation. I would not consider that I had the power to elide or supply a single letter, if by such act I changed the term from what was originally proposed and intended by its describer. My conviction is that, except in manifest errors of *typography*, names should be let alone. Errors of orthography may be left to stand.

7. What credit should be given for generic and specific names? Write the name of the author of the specific name, *without* parentheses, whether there have been a dozen transfers or none at all to a new genus. There is no necessity whatever for shedding glory upon the one who made the transfer. Usually he erects a new genus to accept the transferred species, and the fact that his name will go down the corridors of time coupled to the genus he erected is glory enough. He has no right whatever to the species. Even if he does not erect the genus, he certainly has full credit in the literature for making the change, and the act does not demand recognition in the system of nomenclature itself.

I would write *Metzgeria pubescens* Schrank, to use the example given in the article referred to, and make no more ado or trouble about it. This signifies *always* that the authority named described the species originally and originally proposed that name. The founder and date of the genus can be ascertained by referring to any monograph. The generic conceptions of the original authority should not enter into consideration at all.

As to the question of "once a synonym, always a synonym," I believe in the negative. If a form, which had been described and then thought to be the same as some other species, is later proven to be a valid species, the name originally proposed should stand.

Generic names should not agree too closely in orthography. I should say that *Richardia* ought to preclude *Riccardia;* certainly *Cæsia* should preclude *Cesia.* I do not think that different derivation, or original meaning, presents any excuse for similarity of terms. The difference should be sufficient to preclude any possibility of error on the part of a student unfamiliar with both terms. I believe also that a generic term already used in botany should not be proposed in zoölogy, and *vice versa.* I would be cautious about changing those which have already been of long standing, however.

Lastly, specific names should never be capitalized or written with a hyphen; and no comma should be inserted between the specific name and its authority. It would be a great boon to biologists if absolute uniformity could be infused into the system of nomenclature.

C. H. TYLER TOWNSEND.

New Mexico Agricultural College, Sept. 1.

Grand-Gulf Formation.

I HAVE read with great interest recent contributions to the literature of the Grand-Gulf formation, including Professor Hilgard's valuable paper in the *American Journal of Science* and Judge L. C. Johnson's letter in your last issue. As I have recently been summarizing our knowledge of the Post-Eocene Tertiary (to appear shortly in Bulletin 84, U. S. Geological Survey, which is already in type) I am moved to add a few words in regard to the subject for your columns, which I have already expressed in correspondence with several of those interested.

At the time of the Grand-Gulf sedimentation the lower valley of the Mississippi was already the theatre of estuarine conditions and operations, which date to a very ancient geological time. Toward the end of the Chesapeake or newer Miocene epoch this gulf extended far into the interior, its south-eastern point of entrance being somewhere in the meridian of Mobile, or between Mobile and the Appalachicola River. The embayment, which I have called the Gulf of Mississippi, received an immense drainage, corresponding to that of the whole Mississippi valley and perhaps that of the upper lakes of the present St. Lawrence system. The operations in progress consisted in the transfer of material from the elevated interior to this gulf by the medium of the drainage, and in all probability a gradual or intermittent shifting of level as weight was removed from the uplands and deposited beyond the shore-line. The shallows, as I conceive it, sank and the interior rose, thus preserving a sort of balance, and there is some reason to suppose that a specially important movement took place at the end of the Grand-Gulf epoch, by which the more energetic degradation characterizing the Lafayette epoch was inaugurated, the Strait of Georgia closed, and the previously existing islands of central Florida were joined to the mainland. I agree entirely with Hilgard's view that elevation was essential for the geological operations which are recorded in the stratigraphy of these two epochs.

The Grand-Gulf strata show gravels, sands (now frequently